	L #	Hits	Search Text	DBs
1	L1	1019	head adj suspension adj assembl$3	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
2	L2	233	static adj attitude	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
3	L3	76	1 and 2	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
4	L5	177530	polariz$5	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
5	L6	4	3 and 5	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
6	L7	3	("5257087" | "5480775" | "5636013").PN.	USPAT

	L #	Hits	Search Text	DBs
7	L8	0	5929987.URPN.	USPAT
8	L9	9	2 and 5	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
9	L10	52	1 and 5	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB

TDB-ACC-NO: NN9405461

DISCLOSURE TITLE: Head/Suspension Assembly Static Pitch/Roll Angle Tester

PUBLICATION-DATA: IBM Technical Disclosure Bulletin, May 1994, US

VOLUME NUMBER: 37

ISSUE NUMBER: 5

PAGE NUMBER: 461 - 462

PUBLICATION-DATE: May 1, 1994 (19940501)

CROSS REFERENCE: 0018-8689-37-5-461

DISCLOSURE TEXT:

This document contains drawings, formulas, and/or symbols that will not appear on line. Request hardcopy from ITIRC for complete article.

- The disclosed device is a tester that measures the static pitch/roll angles of slider air-bearing surface after it is mounted on the suspension and has applications in both manufacturing and and development process of the direct access storage device industry. A device as disclosed can be used to further reduce the manufacturing tolerance in order to meet the ever increasing demand on improving the direct access storage devices performance.

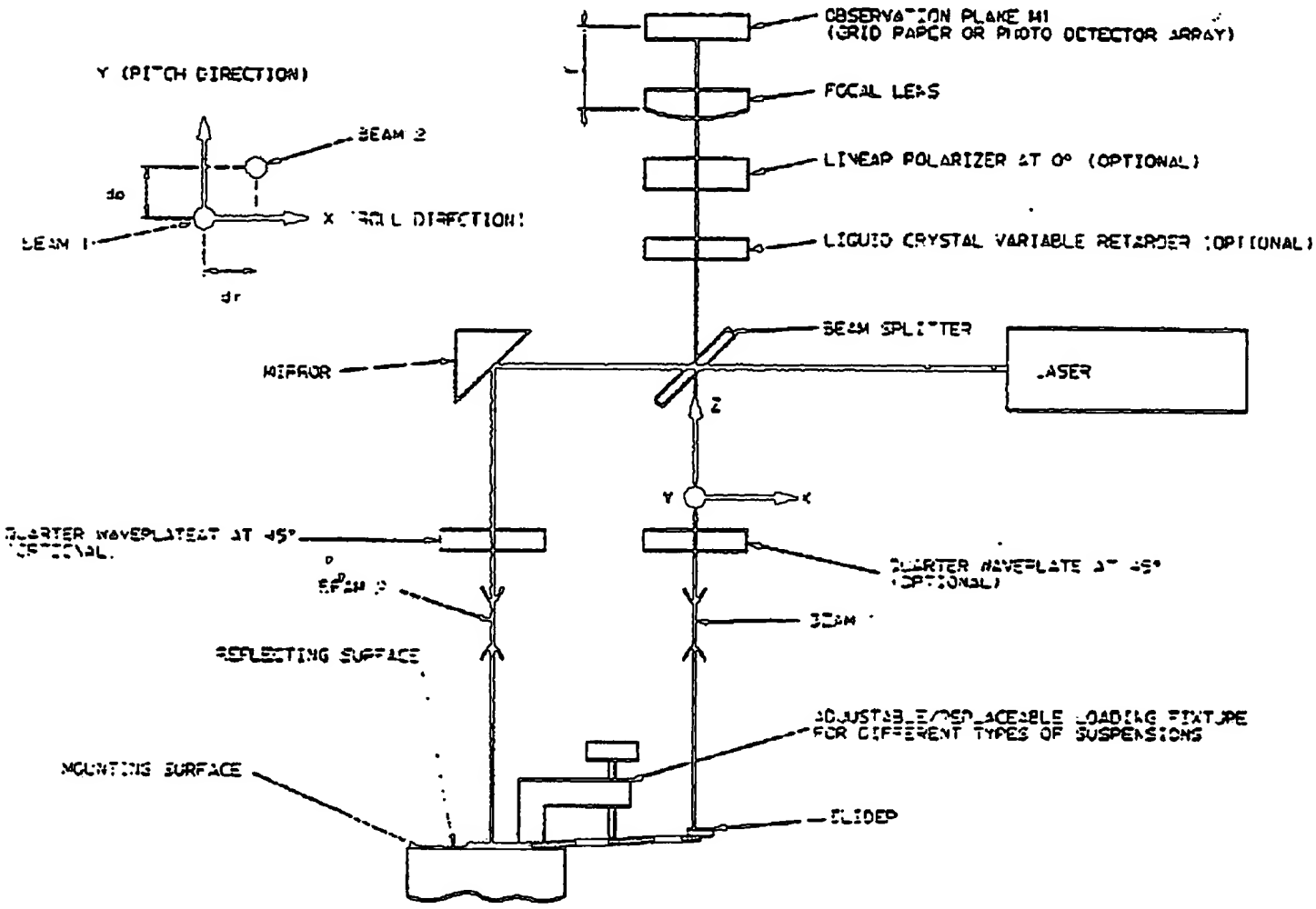
- The schematics of the disclosed system is shown in the Figure. A collimated laser beam is split by a beam splitter which can be polarization sensitive or insensitive depending on the reflection property of the slider air-bearing surface and the complexity of the

system desired. The two quarter waveplates are also optional that can be removed from the design if a non-polarizing beam splitter is used. To simplify the understanding of the principle behind the disclosed device shown in the Figure, the beam splitter will be assumed to be a non-polarization beam splitter and psosess equal efficiency for transmitted and reflected beams. The two quarter waveplates will also assume to be absent.

Since the head/suspension assembly specifications measure the static pitch and roll angle of mounted air-bearing surfaces from the back of the suspension mounting plate, the reference surface R sub 1 is designed to be the top surface of the mounting fixture. A reflecting surface, which can be generated by either evaporating a 100 nm aluminum thin film or by precisely mounting a flat mirror, is placed on top of the slider mounting fixture. The two beam spots, one reflected from the slider air-bearing surface and the other reflected from the reference reflector, was focused by a focal lens. By observing the images in the focal plane turns the incoming light propagation angles difference into spatial separations.

The relative angles, which is the slider air-bearing surface static pitch and roll angles can be determined by measuring the relative spacing of the two light beam spots at the focal plane of the lens. More specifically, the relative angles can be determined by theta sub p - tan sup <-1> lparen d sub p / f rparen, theta sub r = tan sup <-1> lparen d sub r / f rparen, where the f is the focal length of the lens used. Once the system is built, only the directions that distinguish the pitch

and roll angle
of a head/suspension assembly need to be aligned with respect to the
disclosed device. There is no need to control the relative distance
and angle between the mounting fixture and the observation plane M
sub 1.
- The above mentioned optical system can be easily automated.
First, put all the quarter waveplates in place as shown in the
Figure, then replace the non-polarizing beam splitter with a
polarizing beam splitter. Afterwards, a liquid crystal variable
waveplate is placed with its fast axis oriented at phi = 45&degree.,
and a high extinction ratio linear polarizer placed at 0&degree.. a
position sensitive photo-detector is placed in the observation plane.
The light spot reflected from the slider air-bearing surface will
appear in the photo-detector when the liquid crystal variable
waveplate is set as a half-wave plate. The light spot reflected from
the reference reflecting surface located on top of the slider
mounting fixture will appear in the photo-detector when the variable
waveplate becomes an full waveplate.
The relative distance between
the two spots can be quantitatively determined to be d sub p and d
sub r. Substituting these two quantities into the Equation measures
the head/suspension assembly static pitch and roll angles.



* A SLIDER STATIC PITCH/ROLL ANGLE IS DEFINED FROM THE BACK OF THE MOUNTING BLOCK TO THE AIR-BEARING SURFACES

SCHEMATIC OF A HEAD/SUSPENSION ASSEMBLY STATIC PITCH/ROLL ANGLE TESTER.